

PROF. TROWBRIDGE lately observed that a steel bar magnetised to saturation at  $20^{\circ}$  C. and subjected to a temperature of  $-60^{\circ}$  C. lost 66 per cent. of its magnetism (a much greater percentage than that formerly observed by Wiedemann).

PROF. ROBINSON of Ohio concludes from experiments (*Four. Frankl. Inst.*, March) that vibrations in extended media from a remote single centre of disturbance, can only be longitudinal, even in light; that vibrations will be to some extent transversal when due to two or more centres of disturbance not in the same line; and that undulations, to be in a condition called polarised, must consist of vibrations which are transversal, and that no necessity exists for assuming vibrations transversal in front of a polariser. These views are not only contrary to the accepted wave-theory of light, and to the conclusions derived from Maxwell's electromagnetic theory, but appear to be directly negatived by the experiments of Stokes and Fizeau.

IN his third paper on electrical shadows (*Gott. Soc. Nachr.*, February 5) Herr Holtz studies, *inter alia*, the differences in form of the light surface and shadows from the two electricities; the effects of using differently-conducting surfaces under the silk, and of using convex and concave spherical or cylindrical surfaces; the double shadows from two surfaces used as electrodes; the use of a silk screen between pointed electrodes, &c.

A NEW seismometer is described by Dr. G. Wagener of Kioto, Japan, for which he claims several advantages over the ordinary heavy-pendulum seismometers. It consists of a strong rigid frame in the form of a short quadrangular pyramid, from which is suspended an iron ball weighing about fifty pounds by means of a bundle of untwisted silk fibres three feet long. Below this ball is an indicating pendulum consisting of a hollow sphere pivoted near its centre of suspension upon a small polished ball, also rigidly fixed to the frame, and carrying beneath it a light arm, whereby its motions are multiplied twenty-four times. A small sphere fixed to the bottom of the iron ball plays into a cavity in the summit of the indicating pendulum. The latter has, by reason of its construction, a very short period of oscillation as compared with that of the iron ball. Hence when an earthquake occurs the inertia of the heavy ball will keep it for a considerable time in its position, while the pointer of the indicating pendulum moves toward the region whence the disturbance came, and can return almost instantly if the horizontal displacement be succeeded by a displacement in the opposite direction. That the movement of the pendulum may be registered accurately in point of time, a small silk thread attached to the bottom of the indicating pendulum passes through a small eye-hole in a porcelain plate immediately beneath, and thence passes round a light indicating wheel which is also in connection with a lever which at the slightest movement drops, and stops a clock. A kindred apparatus is employed to register the direction of the shock, eight threads from the indicating pendulum of a similar instrument being wound round eight indicating wheels for the eight chief points of the compass. For these instruments it is claimed that there is less error from oscillations than in the usual instruments, the inertia of the indicating pendulum checking the tendency of the weight to swing. A further registering apparatus, consisting of a chronograph drum actuated by a clock which is started by the first shock, is also described. It does not appear that the registering apparatus of Dr. Wagener is in any way an improvement upon the electrical apparatus hitherto employed. Lastly, Dr. Wagener describes an instrument for measuring any possible vertical displacements, a heavy body of considerable inertia being counterpoised while immersed in a tub of water, its movements being magnified by a lever and registered by a thread-wheel arrangement.

M. GAIFFE gives us reason to suppose that part of the disturbance in telephone lines, usually set down to "induction," is due to the conducting-wires being of a magnetisable metal iron, which, when moved in the magnetic field of the earth, experience induction-currents. M. Gaiffe introduced into a telephone-circuit two pieces of steel wire, one magnetised, the other not. On hitting them so as to make them vibrate sharply, sounds were produced in the telephone more strongly by the magnetised strip. The remedy is obviously to employ conducting-wires of some non-magnetic substance, such as copper or manganese bronze.

ACCORDING to P. Tacchini, there are in the sun two regions of spots and faculae at about equal distance ( $20^{\circ}$  and  $22^{\circ}$ ) from the equator, and about the same longitude, which showed con-

tinual activity last year. The fact he considers important for theories as to the sun's physical constitution.

THE last number of the *Journal of the Chemical and Physical Society of St. Petersburg* (vol. xiii., fascicule 4) contains two letters by Prof. A. M. Boutleroff on ice under critical pressure. The former of them was written on February 13, when Prof. Boutleroff had not yet received the number of *NATURE* which contains a detailed description of Prof. Carnelley's experiments; the second on March 17. The experiments which he has made, and which he describes in this second letter, were made, Prof. Boutleroff says, on the same conditions as those of Prof. Carnelley, but the temperature of ice remained at  $-6^{\circ}$ ; a rise of temperature was observed only when a part of the bulb of the thermometer was free from ice, but even in this case it was very slow. "The refrigerating influence of ice was quite manifest, but it was not at any time possible to discover anything showing a rise of temperature." Prof. Boutleroff supposes that Prof. Carnelley has raised the temperature of his thermometer without raising that of ice. "It is true," he says, "that the calorimetric experiment of Prof. Carnelley seems to speak in favour of a heating of the ice itself; but can we not suppose that a kind of covering of hot vapour which was around the ice, remaining on its surface, was transported into the water of the calorimeter, and there neutralised the refrigerating power of the ice?" Prof. Boutleroff proposes also, for the same experiments, to make use of a cryophorus which might be easily appropriated for that use, and which he describes in that case as a cryoscope. When repeating Prof. Carnelley's experiments with a cryoscope, Prof. Boutleroff happened to raise the temperature of the thermometer to  $+40^{\circ}$ , whilst the bulb of the thermometer was nearly completely covered with ice; but he failed to raise the temperature when he covered the surface of the bulb with a small sheet of platina. He concludes that the bulb of the thermometer in those cases, when it shows a temperature above zero, enters into contact with ice only at some few spots; and the rise of the thermometer might be explained, not only by the thermal translucency of the ice, but also by the circumstance that the vapour disengaged by the melting ice is heated, and reaches the bulb of the thermometer by the small channels formed in the ice; he therefore concludes that Prof. Carnelley's condition as to the ice being in a special state not quite reliable.

## GEOGRAPHICAL NOTES

DR. WILD, president of the International Polar Commission, has issued a circular stating that six countries have already intimated their intention to co-operate in carrying out the scheme of simultaneous meteorological, magnetical, and other physical observations in the Arctic regions. These countries, with the proposed stations, are Denmark at Upernivik, Norway in Finmark, Austria-Hungary in Jan Mayen, or perhaps East Greenland, Russia in Novaya Zemlya and at the mouth of the Lena, Sweden in Spitzbergen, and the United States at Point Barrow and in Lady Franklin Bay. Should other countries send in their adhesion to the scheme, this disposition of the stations may be somewhat modified. We are glad to see there is a probability that Germany may establish a station in the Island of South Georgia, and France a station at Cape Horn. An interesting feature in the scheme is that two of the eight proposed Arctic stations are to be equipped at the expense of private individuals, viz., the station in Jan Mayen or in East Greenland at the expense of Count H. von Wilczek of Vienna, and the station in Spitzbergen, as our readers are already aware, by M. L. O. Smith of Stockholm. Is it possible that no public-spirited Englishman will be found to provide the means for England co-operating in this truly international scheme of physical observations in the Polar regions, which play such an important rôle in the meteorology of the globe?

As much has been heard of late respecting the magnificent harbour which the French are likely to make of Lake Bizerta in Tunis, it may be well to correct a misapprehension which has long existed as to its depth. Even in the most recent gazetteers this is said to be fifty fathoms, whereas in a brief but excellent paper which he sent to the Geographical Society many years ago, Admiral Spratt, speaking from his own soundings on the spot, explicitly states that the greatest depth of water in the lake is eight fathoms, with an average of from five to six fathoms. This would no doubt be sufficient for all practical purposes, but at the

same time it is vastly different from the great depth given to the lake by old travellers, whose mistake has been perpetuated.

IN his anniversary address to the Geographical Society last week Lord Aberdare paid a just tribute to the services rendered to geography in the region west of Lake Nyassa by Mr. F. C. Selous, who has hitherto been best known as a mighty hunter of large game. This gentleman, we learn, in 1878 penetrated for 150 miles the unknown country north of the Zambesi, in the direction of Lake Bangweolo. He has since crossed in various directions the Matabele country south of the Zambesi, discovering two new rivers and defining the courses of others which had previously been laid down from vague information. His notes on the River Chobe have already been published by the Geographical Society. We understand that the fine trophies of the chase which Mr. Selous brought back from South Central Africa have been placed in the hands of Messrs. Rowland Ward and Co. for preparation.

FROM the report of the progress of the Ordnance Survey which has just been issued, accompanied by useful diagrams, we learn that it is expected that the whole survey will be completed by 1890, as the staff is to be augmented in consequence of increased funds being placed at the disposal of the Director-General.

THE programme of the first German "Geographentag" at Berlin, on June 7 and 8, contains the following addresses:—Prof. Zöppritz (Königsberg), on the condition of the earth's interior; Prof. Neumayer (Hamburg), on the importance of magnetic researches from a geographical point of view; Prof. Rein (Marburg), on the Bermuda Islands and their coral reefs; Prof. Bastian (Berlin), on the problems of ethnology; Prof. Kirchhoff (Halle), on the methods of teaching geography in schools. Professors Wagner, Meitzen, and Ascherson will speak on similar subjects.

DR. CREVAUX has completed his third South American journey. He descended the Guayabero River (a tributary of the Orinoco) on rafts, and made an exact survey of this river. The survey comprises 1275 miles, of which 375 are a complete desert. By the assistance of natives Dr. Crevaux and his companions reached Ciudad-Bolivar, whence they embarked for Trinidad on board a steamer. Shortly before the end of the journey one of the travellers, a sailor of the name of Burban, was killed by a sting-ray (*Trygon pastinaca*). Later on Dr. Crevaux visited the villages of natives in the Orinoco delta, collecting interesting anthropological data.

THE Central Union for Commercial Geography at Berlin intends to erect a Commercial Geographical Museum in that city. The preliminaries are so far completed that a hall for exhibiting the objects has been hired, a provisional committee formed, and the bye-laws printed. The Union is rapidly extending its branches all over Germany. Among the latest foundations are those at Cassel, Marburg, Hanau, Frankfurt, and Wiesbaden, *i.e.* no less than five in the province of Hessen-Nassau.

AT the May meeting of the Berlin Geographical Society the latest news of the German explorers in Africa were communicated to the members. A letter from Dr. Rohlf's was dated from Gondar. The traveller knew nothing of the death of the King of Abyssinia. The disposition of the king for the further journey of Dr. Stecker was very favourable, and the latter was to leave at once for Shoa-land with a guide. Dr. Pogge and Lieut. Wissmann had arrived at Malange on January 25. Here they intended to stay a while before leaving for the interior. Dr. Buchner arrived at Malange on March 8 on his return journey, and met Major von Mecho. Buchner's misfortune of being obliged to turn back after three unsuccessful attempts to penetrate further is already known to our readers. From Madagascar a letter was received from Dr. Hildebrandt. He left Tananarivo on February 17, and travelled southwards with great hopes of a speedy success.

A LETTER from Dr. Junker to the Austrian Consul at Chartum dispels all the rumours afloat regarding his supposed assassination. He only returned to his station in December last from the journey he had taken. He first crossed the Welle River and travelled in a westerly direction to the Mangbattu tribe. Then he proceeded to some Government stations in Eastern Mangbattu land, getting a little beyond Munsu's former residence, in the vicinity of which is Miam's tomb (not in the Niam Niam land, as indicated by the Italian map). The traveller crossed the Gadde and Bibali rivers at their confluence, and then returned to his station.

THE new number of *Le Globe* opens with a continuation of M. de Morsier's papers on the plains and deserts of the two continents, and also contains a sketch of the geographical work of last year by M. Bouthillier de Beaumont, as well as notices of the Arctic campaign of 1880 and the *Jeannette* expedition.

SOME long letters have recently been received from Père Livinhac, the head of the Algerian Missionary Expedition in Uganda. In referring to the organisation of the country he says that under the *Kabaka*, or absolute monarch, are the chiefs of the great families, called *Mohamis*, of whom three specimens came to England last year with Messrs. Wilson and Felkin. After these come chiefs of inferior rank, who own allegiance to the *Kabaka* through the *Mohamis*. Last of all is the class of slaves or *Wadu*. Mtesa, Père Livinhac says, is regarded by his subjects as a species of divinity, and they attach a supernatural virtue to objects which he has touched. He however appears to be very much under the influence of a clique of *Mohamis*, who threaten to dethrone him if he encourages foreigners.

THE Queensland Government have lately issued a large scale map of part of the Colony, on which is laid down the proposed route of the transcontinental railway to Point Parker, on the Gulf of Carpentaria. This, we observe, crosses the lower course of the Gregory, where, according to a recent official report, that river overflows and covers most of the plains for a considerable distance on either bank. It is difficult to reconcile this uncomfortable fact with the report of Mr. Watson's expedition, to which we lately referred, that high ground ran right down to Point Parker. If this be really the case, the surveying expedition must have followed a different course to the westward of that laid down for it, possibly crossing the Gregory at a much higher point in a comparatively unknown part of the country.

WE regret to learn that Père Law, whose unfortunate expedition from Gubuluwayo to Umzila's country was referred to in NATURE of May 5, died of fever and general exhaustion at that chief's kraal last November. During his comparatively short stay in Africa he had rendered conspicuous service to geography by the determination of numerous heights and positions.

A VERY interesting experiment is to be tried in West Central Africa by the members of the Livingstone (Congo) Inland Mission. We understand that seeds of the different species of *Chinchona*, which have been obtained from the Government plantations in India, are to be sent out to them with a view to ascertaining whether it could be successfully cultivated in the mountain valleys of the Congo.

It is probable that the successor of Admiral La Roncière le Noury, late President of the French Geographical Society, will be M. Ferdinand de Lesseps.

### SOLAR PHYSICS—SUN-SPOTS<sup>1</sup>

TO the student of science who contemplates the sun by day or the stars by night two questions will inevitably occur. The first will have reference to the source from which those vast orbs have derived their stupendous store of high-class energy; the second to the astonishing regularity with which they are able to give it out. It is not impossible to measure in a rough way the amount of heat which our own sun must have possessed. For in the first place we are forced to allow that our luminary must have shone as it does now for millions of years. In the next place [the amount of solar heat received by the earth in one year will about liquefy a layer of ice 100 feet thick covering the whole surface of the earth; and lastly, the sun gives out 2,300,000,000 times as much heat as the earth receives.

These considerations viewed together will perhaps enable us to form a faint conception of the amount of light and heat which our luminary must have given out during its prolonged existence. And yet the sun is by no means one of the most powerful stars, being only about the average in brightness.

We ask then, in the first place, from what source has this inconceivably vast store of energy been derived? If science be not able with absolute certainty to reply to this question, it is yet able to indicate the most probable origin of the supply.

The only hypothesis yet thought of that can account for it is that which first occurred to Mayer and Waterston, and which has been worked out by Helmholtz and Thomson in such a way

<sup>1</sup> Lecture in the Course on Solar Physics at South Kensington; delivered by Prof. Balfour Stewart, F.R.S., April 27.